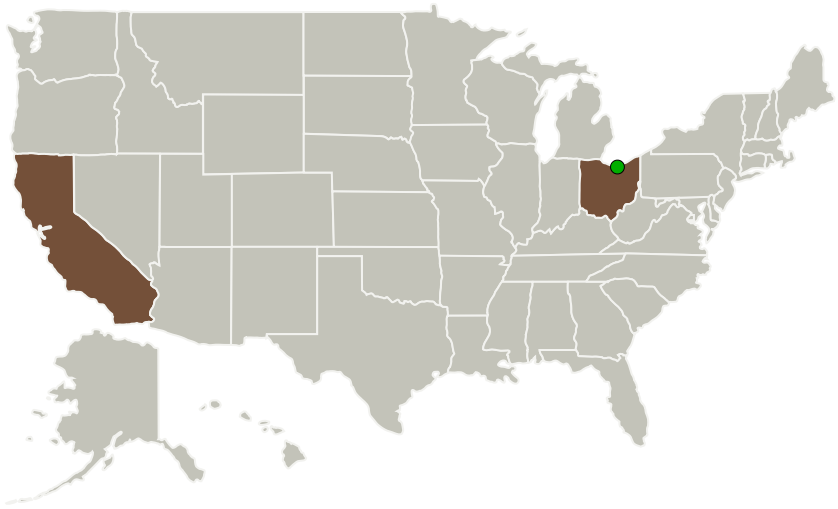
An LED-Based, Laboratory-Scale Solar Simulator for Advanced 3, 4, 5 & 6 Junction Space Photovoltaic Power Systems, Phase II

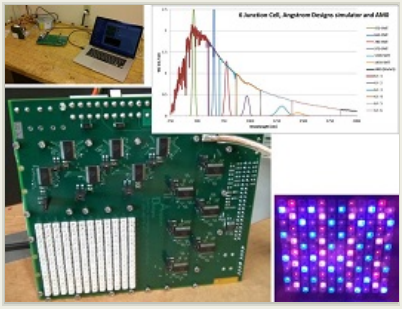
Completed Technology Project (2014 - 2016)

Project Introduction

As a result of significant technical effort, the Phase I was successful in delivering a solar simulator prototype that not only proved the initial concept but will significantly reduce future risk and increase our ability to deliver a fully-functional solar simulator in Phase II. The proposed innovation is an LED-based, laboratory-scale, solar simulator. The proposed innovation simulates AM0 response of single, dual, 3, 4, 5 and 6 junction solar cells by using an array of different wavelength LEDs in close proximity to the cell under test. The simulator is adjustable in spectral matching for selected wavelengths and Class A, the highest standard, for spatial uniformity and temporal stability. The solar simulator illuminates a square area 10 inches by 10 inches and includes optical sensors so that all metrics can be calibrated and validated automatically as needed. Solar simulation is critical for all solar cell testing, and current simulators will not work for coming 4, 5 and 6 junction technologies. Because the vast majority of NASA missions rely on solar cells, this is critical, enabling test technology for future solar cells. While accurate solar simulation is critical to all solar cell missions, it is particularly important to missions requiring large amounts of power, such as solar electric propulsion (SEP) missions. Beyond NASA's needs, other members of the aerospace community, including solar cell manufacturers, test labs and research institutions, have a critical need for this capability which presents excellent commercialization opportunities after the Phase II maturation of the technology.

Primary U.S. Work Locations and Key Partners





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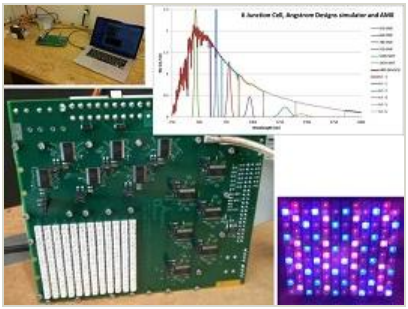
Organizations Performing Work	Role	Type	Location
Angstrom Designs, Inc.	Lead Organization	Industry	Santa Barbara, California
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
University of California-Santa Barbara(UCSB)	Supporting Organization	Academia	Santa Barbara, California

Primary U.S. Work Locations	
California	Ohio

Images

Final Summary Chart Image
An LED-Based, Laboratory-Scale Solar Simulator for Advanced 3, 4, 5 & 6 Junction Space Photovoltaic Power Systems, Phase II Project Image
(https://techport.nasa.gov/image/129418)



Project Image
An LED-Based, Laboratory-Scale Solar Simulator for Advanced 3, 4, 5 & 6 Junction Space Photovoltaic Power Systems
(https://techport.nasa.gov/image/127600)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Angstrom Designs, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Casey P Hare

Co-Investigator:
Casey Hare

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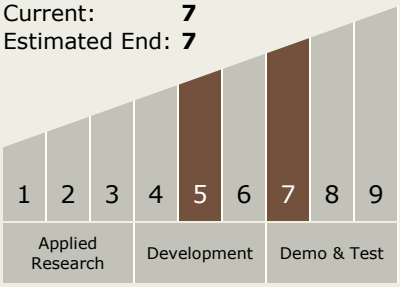
Technology Maturity (TRL)

Start: **5**
Current: **7**
Estimated End: **7**



Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.1 Photovoltaic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System